Dec. 4, 1962

J. J. FILLIUNG

3,066,314

AUTOMATIC FLUSHING SYSTEMS

Filed June 9, 1960

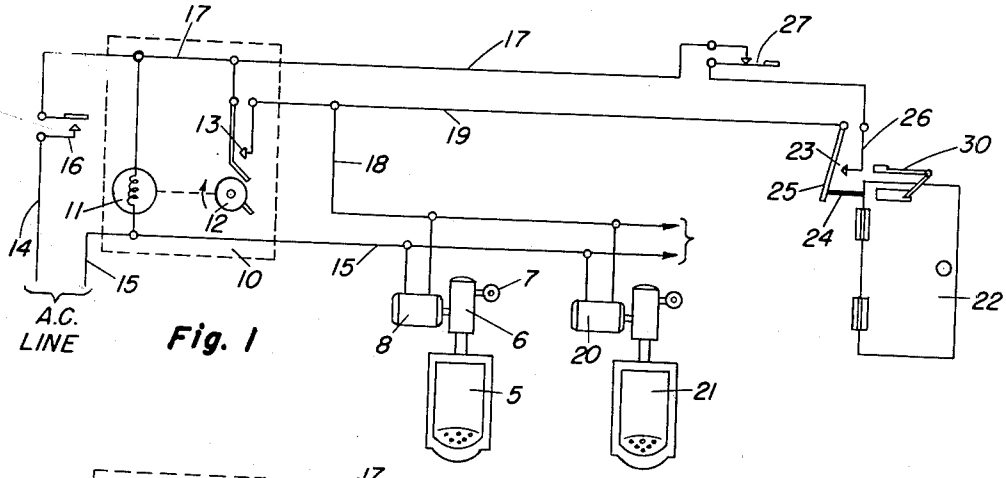


Fig. 1

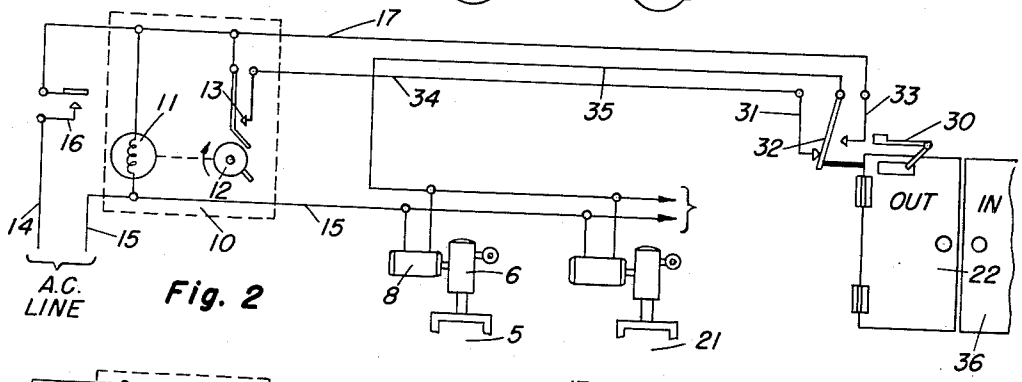


Fig. 2

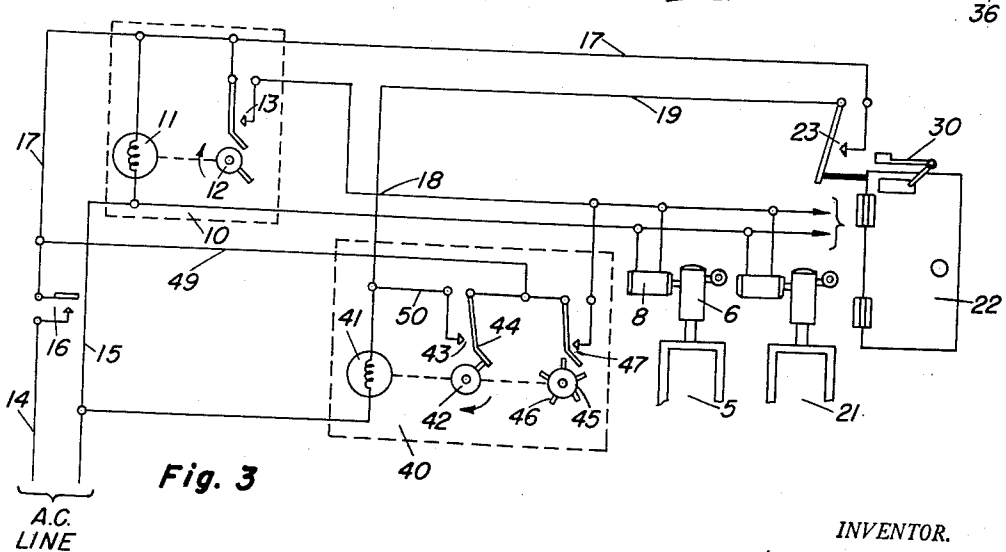


Fig. 3

INVENTOR.
JACQUES J. FILLIUNG

BY

PARKER & CARTER

ATTORNEYS

United States Patent Office

3,066,314

Patented Dec. 4, 1962

3,066,314

AUTOMATIC FLUSHING SYSTEMS

Jacques J. Filliung, Chicago, Ill., assignor to Sloan Valve Company, Chicago, Ill., a corporation of Illinois

Filed June 9, 1960, Ser. No. 34,922
22 Claims. (Cl. 4—101)

This invention relates in general to plumbing systems, but more particularly to a system for automatically controlling the operation of flush valves for plumbing fixtures, and the principal object of the invention is to provide a new and improved system and arrangement for automatically operating flush valves for urinals in a toilet room.

Another object is to provide an electric flushing system for urinals in which the flush valves are automatically operated at predetermined intervals, and in addition are automatically operated at a faster rate when traffic into the toilet room increases.

It is a further object to devise an automatic flushing system for urinals in which the urinals are flushed at two different time rates, one rate automatically by a timing means at predetermined timing intervals, and the other by persons opening the toilet room door to directly cause a flushing operation, independent of the timing means.

Another object of the invention is to provide a new and improved automatic flushing system for urinals in which the urinals are flushed at two different time rates; by one timer for example each five minutes, and by another timer at a much faster rate initiated by a person opening the toilet room door.

In many plumbing installations, especially places frequented by the general public, the urinals usually are provided with flush valves having operating handles which a person must manually actuate to flush the urinal. Many persons, however, for hygienic reasons, are reluctant to touch the flush valve handle, or neglect to do so, and as a result the urinal becomes fouled and obnoxious, thereby creating a health hazard. It is therefore desirable that some means be provided for actuating the flush valves automatically and periodically or by some other means.

While arrangements are known which electrically and periodically cause flush valves to be actuated, such systems usually are arranged to cause flushing operations of the urinals every five or ten minutes, or some other time interval. These relatively long periods between flushes are satisfactory when traffic into the toilet room is normal or no one enters for an extended period. However, in public toilet rooms such as are located at a railroad station or airport, for example, there are times, as upon the arrival of a train or plane, when large numbers of the arriving passengers will enter the toilet rooms almost simultaneously. This places a heavy burden upon the urinals and will quickly foul them up if they are only flushed at a normal rate of say once every five or ten minutes. A good deal of liquid waste matter will be deposited by successive persons using a urinal before it is flushed, and this is obnoxious to subsequent users when the intervals between flushes are too long.

To overcome the foregoing disadvantages in an automatic flushing system, the invention contemplates the use of an arrangement in which the urinals are flushed normally and repeatedly at a rate suitable for what would be a normal amount of traffic into the toilet room, and which then supplements this normal flushing rate with a much faster flushing rate when an increased flow of traffic takes place.

With the foregoing and other objects in view, the invention consists in certain novel features of construction and arrangement of parts and circuit connections which

will be hereinafter more fully described, claimed and illustrated in the accompanying drawings in which:

FIG. 1 is a diagrammatic and schematic circuit arrangement of an automatic urinal flushing system in which the urinals are flushed periodically by a timer and also by the opening of the toilet room door;

FIG. 2 is a modified circuit arrangement in which the opening of the toilet room door disconnects the timer control until the door closes again; while

FIG. 3 is a further modification and circuit arrangement wherein two different timers are provided, one for normal flushing control, and the other timer controlled by the toilet room door, for accelerated rate of flushing.

Referring to FIG. 1 of the drawings, there is illustrated a common plumbing fixture such as a stall urinal 5 provided with a flush valve 6 of any well-known type such as a Sloan Royal flush valve having the usual throttle valve 7 for throttling the inlet supply of water to the flush valve 6. The outlet of the flush valve leads directly into the urinal 5 for flushing the same whenever the flush valve is operated. For the purpose of actuating the flush valve 6, there is provided an electrical operating device 8, preferably in the form of a small fractional horse power motor, as is disclosed in U.S. Patent 2,552,625, issued May 15, 1951, to J. J. Filliung. In most public washrooms the urinals are usually arranged in batteries as shown, and may all be flushed simultaneously.

For controlling the normal periodic operation of the electrical device 8 on each flush valve 6, an electrical timing device shown diagrammatically at 10, is provided. This timer 10 may consist of a small synchronous electric motor 11 for driving the rotatable cam 12 through a suitable gear train, at a speed of about one revolution in every five minutes. Cam 12 is adapted to close a pair of contacts 13 at each revolution for approximately five seconds duration. The timer motor 11 is connected directly across the alternating current supply line wires 14 and 15 for continuous operation as long as the manual switch 16 in line 14 is closed. The cam 12 thereby closes contacts 13 every five minutes to establish an operating circuit for the electric actuating device 8 on the flush valve 6, over the wires 14, switch 16, wire 17, contacts 13, wire 18, winding of electrical device 8, and back to the other side of the supply line 15. The electrical device 8 is actuated for five seconds, causing it to trip the flush valve 6, which in turn passes a metered amount of water into the urinal 5 and then shuts itself off. The urinal 5 is thereby automatically flushed periodically. Since the electrical device 20 of urinal 21 is connected in parallel circuit across wires 15 and 18, the urinal 21 will also be flushed.

The foregoing periodic flushing operation takes place regardless of whether a person enters the toilet room or not, and the purpose is to insure that the urinals do not become dried up to cause waste matter to cling and dry upon the sides of the urinal, and to maintain them in a sanitary condition at all times.

During periods of increased traffic into the toilet room, the foregoing five minute or longer flushing intervals are much too long to satisfactorily maintain the urinals in a sanitary condition and it is therefore necessary to shorten the flushing intervals. This may be accomplished by providing the entrance door 22 to the toilet room with a switch having contacts 23 which are normally biased open when the door is closed and which are closed whenever the door is opened. Switches of this type are well known and consist of a plunger 24 in the door jamb actuated by the door to normally hold contact spring 25 open and away from contact spring 26 but to permit closure of contacts 23 when the door is opened. Contact spring 26 is connected to wire 17 through disconnect switch 27, and contact spring 25 to wire 19. Thus whenever the door 22 is opened by a person either entering or leaving the toilet

room, an actuating electrical circuit is completed for the electrical device 8 to cause the flush valve 6 to be tripped to flush the urinal 5. The established circuit is over wire 14, switch 16, wire 17, disconnect switch 27, springs 25 and 26 through contacts 23, wires 19 and 18, the electrical device 8 and back over the wire 15 to the other side of the line. The urinals 5 and 21 are thereby flushed.

The disconnect switch 27 may be provided in case it would be advantageous to have an attendant close the switch 27 whenever an influx of heavy traffic into the toilet room warrants the increase in flushing rate. At all other times with switch 27 open, the door switch would be ineffective and flushing would only take place under control of the timer 10. The line switch 16 is closed at all times except when repair or mantenance are necessary and the equipment is to be shut down.

It is desirable that the door 22 be controlled to slowly close to prevent slamming, and advantage is taken of this fact to properly effect the operation of the electrical device 8. Most all public and other toilet room doors are equipped with a suitable slow-closing check as indicated at 30. These door checks 30 are usually regulated to permit the door 22 to slowly close in about five seconds and this time is just sufficient to enable the operating device 8 on the flush valve to be properly actuated according to the aforesaid Patent No. 2,552,625, whenever the door contacts 23 are closed.

With the foregoing arrangement, it is seen that successive door openings at close intervals during heavy traffic into the toilet room will cause corresponding fast flushing operations of the urinals to keep them clean. It will be understood also that each time a person enters the toilet room the urinal will be flushed immediately or is flushing when he approaches it, and when he leaves and opens the door 22 to go out the urinal will be flushed again. During heavy traffic flow into and out of the toilet room, the urinals will therefore be flushed almost continuously and that is a most desirable condition under such circumstances. There may be occasions when the flushing control from both the door opening and from the timer 10 will overlap, but this merely results in a slightly longer energization of the electrical device 8 and does not effect the operation of the flush valve 6. During long intervals when no one enters the toilet room, the urinals are flushed periodically by the timer 10 to keep them clean, as pointed out.

In many cases toilet rooms are provided with two separate entrance doors, one for the use of the general public and the other for use by office personnel. The door used by the public would then be equipped with the door switch for fast flushing intervals, while the timer 10 would be effective to flush the urinals every five minutes for personnel using the other door not equipped with a door switch, thus insuring constant cleanliness and sanitary condition of the urinals under all possible conditions of traffic.

In the modification, FIG. 2, the arrangement is similar to FIG. 1, except that the door switch is provided with three contact springs. When the door 22 is closed contact springs 31 and 32 are closed so that the timer 10 is effective to periodically flush the urinals 5 and 21 over a circuit path including line wire 14, switch 16, contact springs 13 (closed every five minutes), wire 34, contact springs 31 and 32, wire 35, through the electrical device 8 and back to the other side of the line over wire 15. However, whenever the door 22 is opened, contact spring 31 is moved away from contact spring 32 and closes upon contact spring 33. This closes the actuating circuit for electrical device 8 over a circuit path, including wire 17, contact springs 33 and 32, and wire 35 to the electrical device 8. Accordingly, whenever the door 22 is opened the timer 10 is cut out to eliminate the possibility of overlapping flushes when both the timer and door switch are simultaneously closing the operating circuits of the electrical device 8. The possibility of a prolonged flushing action by the flush valve 6 is thereby reduced.

In order to eliminate the double flushing action by the door switch as in FIG. 1, such as occurs when the person enters the toilet room and again when he leaves, the modifications of FIG. 2 contemplate the use of two separate doors, as is sometimes provided in public toilet rooms. The door 36 would then be the entrance door and would not have the door switch control on it. The exit door 22, however, is equipped with a door switch as shown and will be opened only by a person leaving the toilet room. In such an installation a flushing action will only take place after a person has used the urinal. This effects a saving of at least half the consumption of water. The fewer flushes during heavy traffic periods into the toilet room would still be adequate to maintain a sanitary condition in the urinals.

Referring now to FIG. 3 in this modification of the invention, the same control of the flush valves by the timer 10 is provided as in FIG. 1. In addition, a second timer 40 is included to provide for the accelerated flushing rate. Timer 40 is directly controlled by the door switch contacts 23. The timer 10 closes its contacts 13 as before, every five minutes for example, to operate the electrical device 8. Timer 40, however, is provided with a driving motor 41 having two sets of cams, one cam 42 has a lobe which in its normal position holds contact springs 43 and 44 spaced apart, and the other cam 45 has a number of lobes 46 each of which is arranged to close contacts 47 when engaging the same. The lobes 46 of cam 45 are preferably spaced so they close contacts 47 about one minute apart.

With the foregoing circuit arrangement, the timer motor 41 is given an initial energization when the door 22 is opened, over a circuit path including line wire 14, switch 16, wire 17, door switch contacts 23, wire 19, winding of timer motor 41, to the other side of the line 15. Only a short movement of the cam 42 by the motor causes contact springs 43 and 44 to close and remain closed for a five minute period until the lobe of cam 42 again comes around and opens the contacts 43. As soon as contacts 43 and 44 are closed, a second circuit for the timer motor 41 is established over wires 14, 49, contact springs 44 and 43, wire 50, winding of motor 41 to the line 15. It will be clear from this that once the motor 41 is started, it will continue to run until contacts 43 and 44 are opened, again stopping the timer. In the interval that the timer 40 is operating any repeated opening of the door 22 will be ineffective upon the timer motor 41 because its circuit is now closed over contacts 43 and 44, and wires 49 and 50. The door contacts 23 only start the timer into operation, while the timer stops its own operation. During the rotation of cam 42, cam 45 also closes the contacts 47 with its lobes 46 at one minute intervals, to operate the electrical device 8, over a circuit path including wires 14, 49, contacts 47, wire 18, electric device 8, and back over wire 15.

The advantages of the system in FIG. 3 are that during heavy traffic into the toilet room the timer 40 will provide one minute flushing periods, while at all other times the timer 10 provides five minute timing intervals. Frequent flushing intervals are thereby attained without relying upon direct operation from the door openings as in FIG. 1 operation and a saving in water is thereby attained.

While a number of modifications of the invention are illustrated and described, it will be appreciated that other variations of the same may be made by those skilled in the art, and it is therefore desired that the invention be not limited to the precise disclosures made, but only by the scope of the appended claims.

What is claimed is:

1. In an automatic flushing system for a plumbing fixture located in a toilet room equipped with a door, a flush valve for flushing said plumbing fixture, an electrical device for operating said flush valve, a first timing

device connected to said electrical device for operating the same at periodic intervals, a second timing device including electrical connections for operating said electrical device at different periodic intervals from said first timing device, a door switch controlled by the opening of said door, a power source and other electrical connections between said door switch and said second timing device whereby said second timing device is started into operation only when said toilet door is opened, said electrical connections including a control switch in each of said timing devices connected in circuit with said electrical device and said power source, and said door switch connected in circuit with said second timing device and said power source.

2. In an automatic flushing system for a plumbing fixture located in a toilet room having a door therein, a flush valve on said plumbing fixture for flushing the same, an electrical device on said flush valve for operating the same, a first timing device for periodically operating said electrical device at certain intervals, a second timing device for periodically operating said electrical device at intervals different from said first timing device, circuit connections between said first timing device and said electrical device for directly operating said electrical device, a door switch closed whenever the toilet room door is opened, a power source and circuit connections between said door switch and said second timing device whereby said second timing device is started into operation when said door is opened to close said door switch, said circuit connections including a control switch in each of said timing devices connected with said electrical device and said power source, and said door switch connected with said second timing device and said power source.

3. In an automatic flushing system for a plumbing fixture located in a toilet room having a door therein, an electrically operated flush valve for flushing said plumbing fixture, a first timing device and a second timing device for controlling said electrically operated flush valve, circuit connections between said first timing device and said electrically operated flush valve whereby said flush valve is operated continuously at certain periodic intervals, a door switch closed whenever said door is opened, a power source circuit connection between said door switch and said second timing device whereby said flush valve is operated at different intervals from said first timing device only when said door switch is closed by the opening of said toilet room door, and means in said second timing device for stopping its operation after one complete cycle of operation, said circuit connections including a control switch in each of said timing devices connected with said electrically operated flush valve and said power source, said door switch connected with said second timing device and said power source.

4. In an automatic flushing system for a plumbing fixture located in a toilet room having a door therein, an electrically operated flush valve for flushing said fixture, a first timing device for controlling the operation of said flush valve, a door switch closed by the opening of said door for controlling the operation of said first timing device, means in said first timing device for maintaining the operation thereof and for stopping the same after a predetermined time interval independent of any repeated opening of said door and the consequent closing of said door switch, said first timing device effective to cause said flush valve to be operated a predetermined number of times during each operation of said first timer, a second timer also controlling the operation of said flush valve and at predetermined time intervals differing from said first timer, said second timer being controlled independent of said door switch, a power source, a control switch in each of said timing devices connected with said electrically operated flush valve and said power source, said door switch connected with said first timing device and said power source.

5. An automatic flushing system for providing fast and slow flushing of a plumbing fixture located in a room having a door, said system including, in combination, a flush valve on a plumbing fixture for flushing the same, an electrical device on said flush valve for operating the same, a first electrical circuit between a source of electric power and the electrical device, a timing device in the first electrical circuit leading to the electrical device, said timing device, when actuated, being operable to substantially regularly actuate the electrical device, and thereby the flush valve, a door switch closed upon opening of said door, and a second electrical circuit leading to the electrical device, said door switch being located in the second electrical circuit, said door switch, when closed, completing the second electrical circuit whereby said electrical device may be actuated, and thereby the flush valve, independently of operation of the timing device.

6. The flushing system of claim 5 further including a manual switch in the second electrical circuit, effective to disconnect said second electrical circuit from the electrical device whereby control of said electrical device is provided solely by said timing device and the first electrical circuit.

7. In an automatic flushing system for flushing a plumbing fixture located in a toilet room and having a door therein, a flush valve for flushing said plumbing fixture, an electrical device for operating said flush valve, a door switch closed by the opening of said door, an electrical circuit between said door switch and said electrical device, and connectable to a power source, whereby said fixture may be flushed when said door is opened, a timing device for also actuating said electrical device at intervals independent of said door switch, said timing device actuating a control switch, and an additional electrical circuit between the control switch and the electrical device, and connectable to the power source, whereby said electrical device is operated when said control switch is closed.

8. The automatic flushing system of claim 7 further characterized in that the door switch and the control switch are connected in parallel with one another, and both are connected in series with the electrical device.

9. In an automatic flushing system for flushing a plumbing fixture located in a toilet room and having a door therein, a flush valve for flushing said plumbing fixture, an electrical device for operating said flush valve, a door switch closed by the opening of said door, an electrical circuit between said door switch and said electrical device, and connectable to a power source, whereby said fixture is flushed when said door is opened, a timing device for also actuating said electrical device at intervals independent of said door switch, said timing device actuating a control switch, an additional electrical circuit between the control switch and the electrical device, and connectable to the power source, whereby said electrical device is operated when said control switch is closed, and means for disconnecting the control of said electrical device by said timer when said door switch is closed.

10. In an automatic flushing system for a plumbing fixture located in a toilet room having a door therein, a flush valve for flushing said plumbing fixture, an electrical device on said flush valve for operating said flush valve, a timing device for periodically operating said electrical device, a door switch on said door actuated when said door is opened, said door switch having normally open contacts which are closed when said door is opened, a circuit between said normally open door contacts and said electrical device whereby said electrical device is operated when said door is opened, said door switch also having normally closed contacts which are opened whenever said door is opened, and a circuit between said normally closed contacts and said timing device, whereby said timer operates said electrical device through said last contacts when said door is closed, and whereby said timing device is disconnected from said last circuit by said last contacts when said door is opened.

11. In an automatic flushing system for flushing a plumbing fixture located in a toilet room having an exit door therein, a flush valve for flushing said plumbing fixture, an electrical device for operating said flush valve, a door switch closed by the opening of said exit door, a circuit between said door switch and said electrical device, and connectable to a power source, whereby said fixture is flushed when said exit door is opened, a timing device for also actuating said electrical device at intervals independent of said exit door, said timing device actuating a control switch, an additional circuit between the control switch and electrical device, and connectable to the power source, whereby said electrical device is operated when said control switch is closed, said exit door switch being effective to disconnect said timer from its control of said flush valve whenever said door switch is actuated by said exit door.

12. In an automatic flushing system for flushing a plumbing fixture located in a toilet room having a separate entrance door and exit door therein, a flush valve for flushing said plumbing fixture, an electrical device for operating aid flush valve, a door switch closed by the opening of said exit door, a circuit between said door switch and said electrical device, and connectable to a power source, whereby said fixture is flushed when said exit door is opened, a timing device for also actuating said electrical device at intervals independent of said exit door, said timing device actuating a control switch, an additional circuit between the control switch and electrical device, and connectable to the power source, whereby said electrical device is operated when said control switch is closed, and means effective to disconnect said timer from its control of said flush valve whenever said door switch is actuated by said exit door, said last means comprising a normally closed exit door switch in said additional circuit which, when opened by opening of the exit door, disconnects the timing device from the electrical device.

13. In an automatic flushing system for flushing a plumbing fixture located in a toilet room having a door therein, a flush valve for flushing said plumbing fixture, an electrical device on said flush valve for operating the same, a timing device for periodically operating said electrical device, a door switch on said door closed when said door is opened said door switch operating said electrical device each time said door is opened and said door switch is closed, and means on said door switch for disconnecting the control of said timer from said electrical device whenever said door switch is closed.

14. In an automatic flushing system for flushing a plumbing fixture located in a toilet room having a door therein, a flush valve on said plumbing fixture for flushing the same, an electrical device on said flush valve for operating the same, an electrical timer for periodically causing the operation of said electrical device, a door switch on said door which is closed whenever said door is opened, said door switch operating said electric device each time said door switch is closed, circuit connections extending between said timer and said electrical device and between said door switch and said electrical device, and means for disconnecting the control of said electrical device by said timer each time said door switch is closed.

15. In an automatic flushing system for a plumbing fixture located in a toilet room having a door therein, a flush valve for flushing said plumbing fixture, an electrical device on said flush valve for operating said flush valve, a timing device for periodically operating said electrical device, a door switch on said door controlled when said door is opened, said door switch having normally open contacts which are closed when said door is opened, circuit connections between said normally open door contacts and said electrical device whereby said electrical device is operated when said door is opened, said door switch also having normally closed contacts which are opened whenever said door is opened, and circuit connections between said normally closed contacts and said timing device, whereby said timer operates said electrical device through said last contacts when said door is closed, and whereby said timing device is disconnected from said last circuit connections by said last contacts when said door is opened.

16. In an automatic flushing system for flushing a plumbing fixture located in a toilet room having a separate entrance door and exit door therein, an electrical operated flush valve for flushing said plumbing fixture, a door switch on said exit door closed whenever said exit door is opened by a person leaving the toilet room, electrical connections between said door switch and said flush valve whereby said flush valve is operated by each closure of said exit door switch, a timing device, and electrical circuit connections between said timing device and said flush valve whereby said flush valve is operated at periodic intervals by said timer independent of closure of said exit door.

17. In an automatic flushing system as claimed in claim 16, the provision of means controlled by said exit door switch whereby said timer is disconnected from its control of said flush valve whenever said door switch is actuated by said exit door.

18. In an automatic flushing system for plumbing fixtures located in a toilet room having an entrance door therein, said toilet room being subject at times to normal traffic through said door and for increased traffic at certain other times, electrical operated flush valves for flushing said plumbing fixtures, a timing device effective to periodically operate said electrical operated flush valves at all times, a door switch on said door controlled by the opening and closing of said entrance door, the closing of said door switch being effective to cause the operation of said electrical operated flush valves each time the door is opened and each time it is closed to accommodate increased traffic, and a manual actuated switch for disconnecting said door switch from control of said electrical operated flush valve during periods of normal traffic into said toilet room.

19. In an automatic flushing system for flushing a plumbing fixture located in a toilet room having a door therein, a flush valve on said plumbing fixture for flushing the same, an electrical device on said flush valve for operating the same, a timing device for controlling the actuation of said electrical device, a switch on said door actuated by the opening of said door, a power source, and electrical connections between said timing device, said door switch and said electrical device, whereby said electrical device is operated periodically by said timing device and additionally each time said door is opened and said door switch is actuated, said electrical connections including a control switch in said timing device connected in circuit with said door switch and both switches connected in series circuit with said electrical device and said power source.

20. In an automatic flushing system for flushing a plumbing system located in a toilet room and having a door therein, a flush valve for flushing said plumbing fixture, an electrical device for operating said flush valve, a door switch closed by the opening of said door, electrical connections between said door switch and said electrical device whereby said fixture is flushed each time said door is opened, a power source, and a timing device for also actuating said electrical device at periodical intervals independent of said door switch, said electrical connections including a control switch in said timing device connected in circuit with said door switch and both switches connected in series circuit with said electrical device and said power source.

21. In an automatic flushing system for flushing a plumbing fixture located in a toilet room having a door therein and a door check on said door to permit the slow closing of said door, a door switch closed by said door when the door is opened, said door switch being held open for at least five seconds as said door slowly closes under control of said door check, the closure of said door resulting in the opening of said door switch, a flush valve

for flushing the plumbing fixture, an electric motor on said flush valve for operating said flush valve, said electric motor having a cam and gear train arrangement requiring at least five seconds for said gear train to rotate said cam for one revolution, said cam causing the actuation of said flush valve, and electric circuit connections between said electric motor and said door switch whereby said electric motor is caused to be energized by said door switch for a time length of not less than five seconds.

22. In an automatic flushing system for flushing a plumbing fixture located in a toilet room equipped with a door, said door having a door check thereon for permitting said door to slowly close over a time period of not less than five seconds, a door switch which is closed by the opening of said door for the time period said door check allows said door to slowly close, a flush valve on said plumbing fixture for flushing the same, an electric motor on said flush valve for operating the same, said electric motor requiring an electric energizing time period of at least five seconds to trip said flush valve, and electrical connections between said door switch and said electric motor for causing the operation of said electric motor for at least five seconds duration.

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